ALMA Data and Archives
what to expect when you're expecting (ALMA data)!

Cassie Reuter

Authors: Sarah Wood, Devaky Kunneriath, Sabrina Stierwalt, Erica Keller, Catarina Ubach

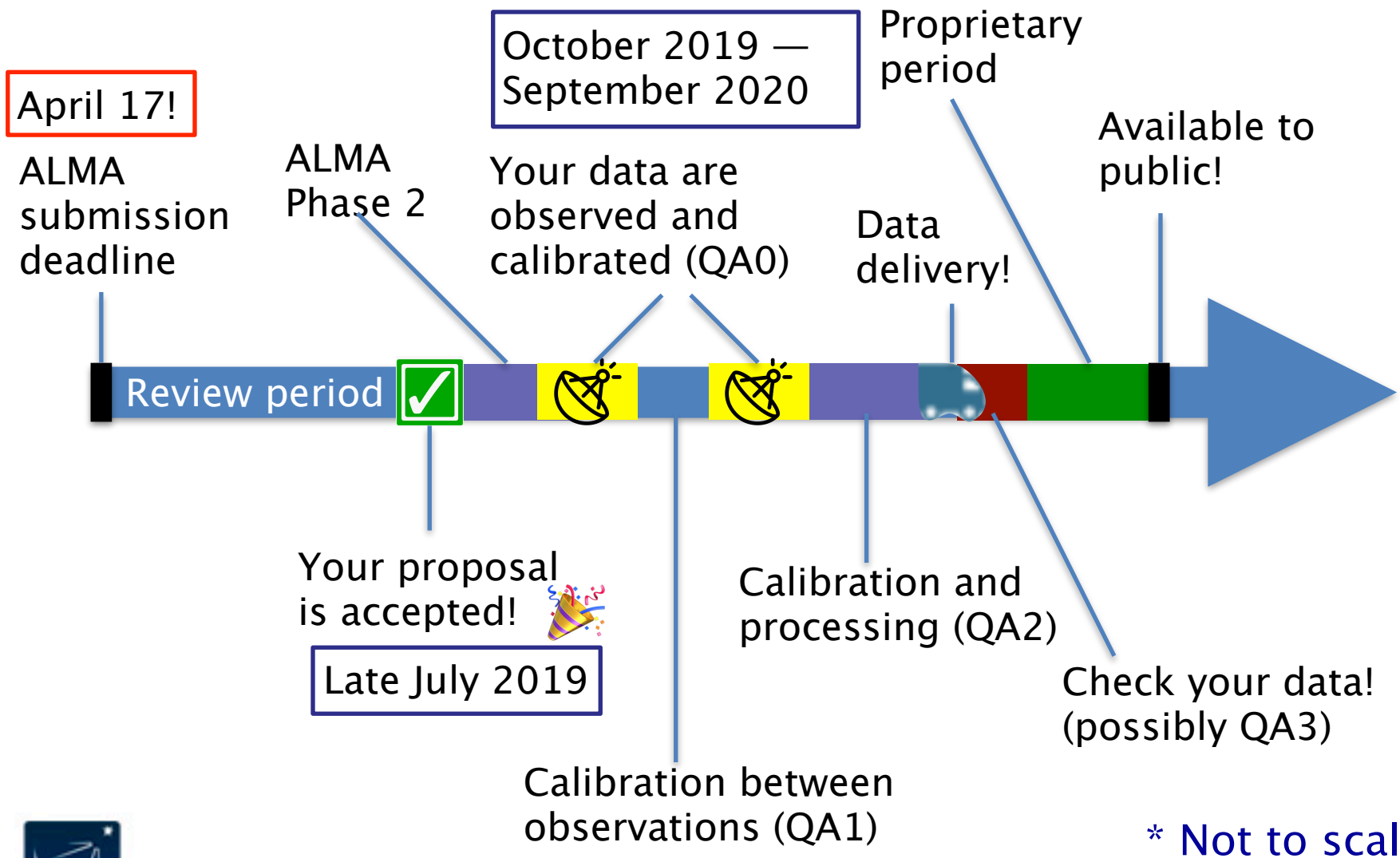
Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array

The Condensed Version

- Data delivered after passing Quality Assurance (QA)
- Download data from *Archive Query* and *Request Handler* tools on the ALMA Science Portal
- Delivered data include:
  - Calibration tables and diagnostics
  - Preliminary images (*better products may be possible with more careful continuum identification & interactive cleaning*)
- Sections 11, 12, 14, and Appendix C of ALMA Technical Handbook

This talk will be available online for reference after this workshop.

An approximate* ALMA timeline



* Not to scale!

Goals of Quality Assurance (QA) Process

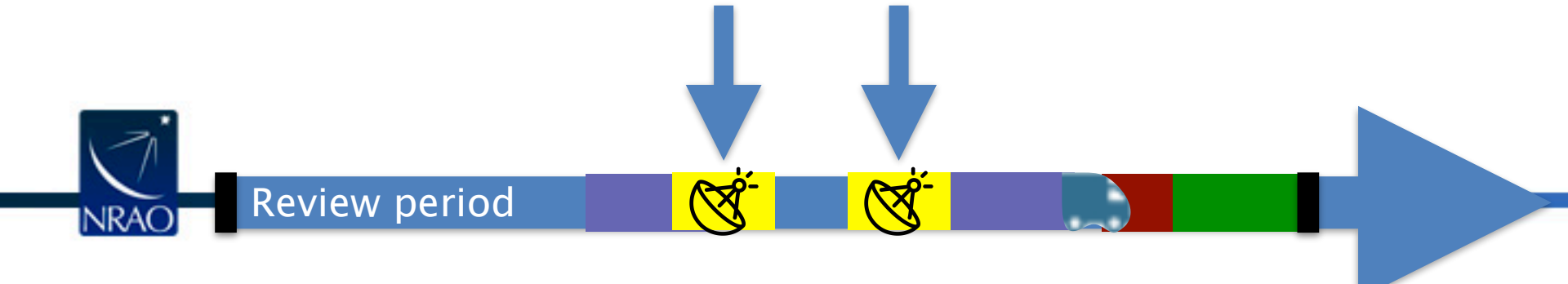
- Ensure reliable final data product
  - Desired sensitivity (as specified by PI)
  - Desired resolution (as specified by PI)
- Ensure calibration and QA imaging free from major artifacts

- Warning: Errors in PI-supplied parameters are outside scope of QA process, including:
  - Incorrect source coordinates
  - Inadequate frequency specification
  - Inadequate sensitivity limits

See ALMA Technical Handbook for details.

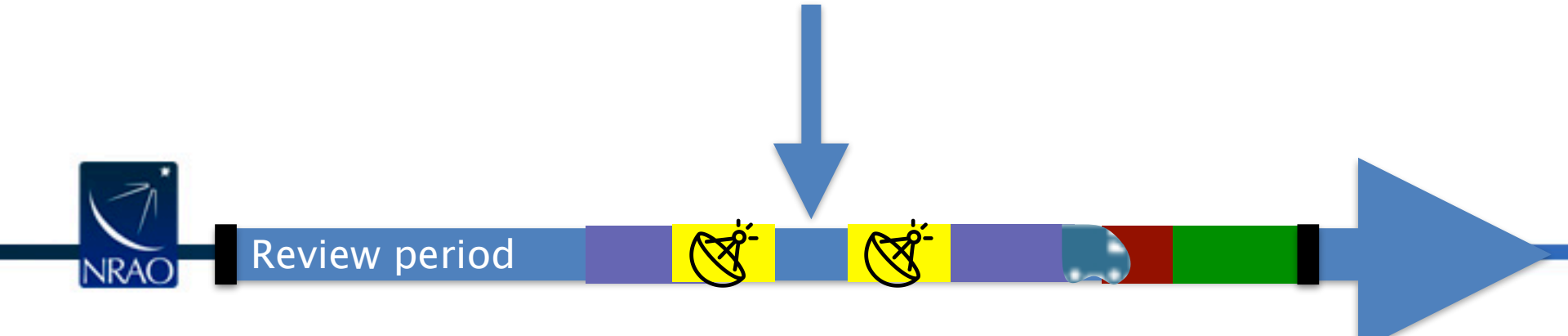
During Observations – QA0

- Monitoring of on-the-fly calibration and system performance
- Rapidly-varying parameters (~EB timescales)
  - Atmospheric effects
  - Antenna issues
  - Front/back-end issues
  - Connectivity issues
- Tolerances for each are explicitly laid out
  - No fewer than 40 antennas in 12m array
  - Bandpass calibrator is strong enough
- Quick reduction may be run to check flux measurements and phase stability



Between Observations – QA1

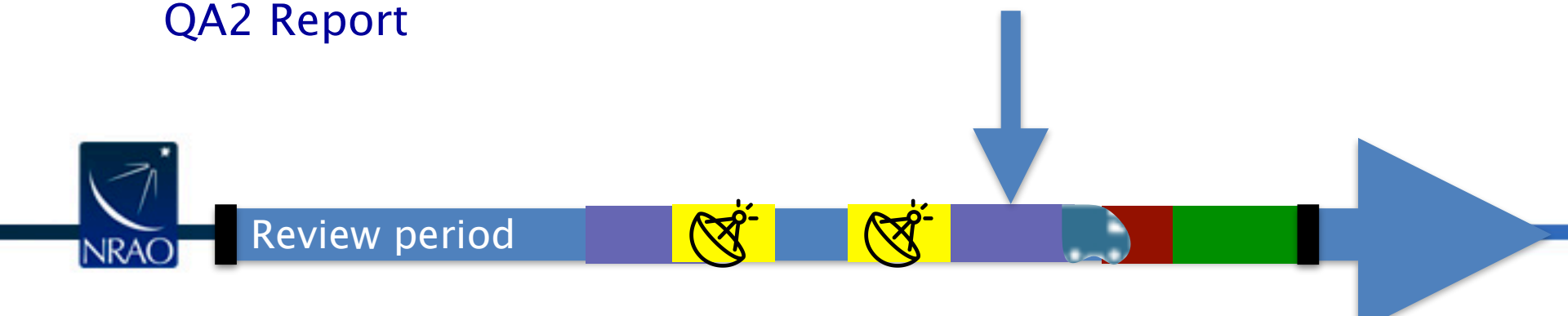
- "Regular array maintenance" timescales
- Slowly Varying Parameters (~>week timescales)
- General array calibration
  - Baseline measurements
  - Delays
- Antenna Calibrations
  - All-sky pointing
  - Focus curves
  - Beam patterns, etc.
- Observatory Calibrator Surveys
  - Solar-system and quasar flux monitoring



After Observations – QA2

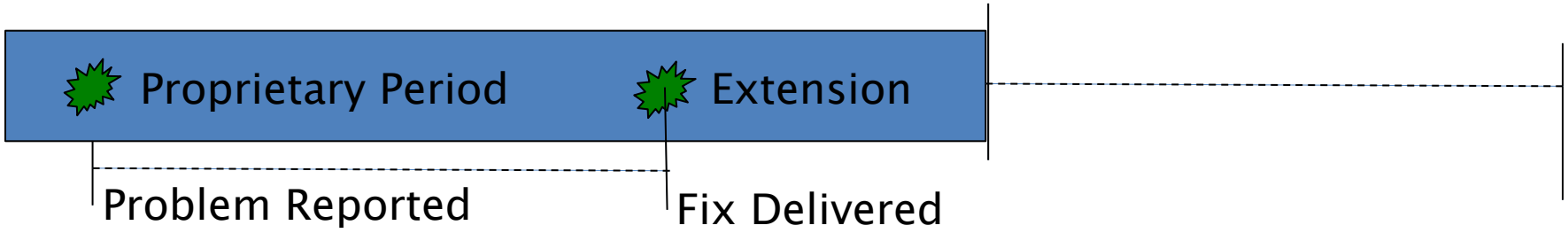
- Calibration by pipeline (~70%), checked by NRAO staff.
- Final QA calibration checks include:
  - Bandpass quality
  - Flux scale calibration
  - Phase transfer and astrometry
- Final data characterization includes:
  - RMS noise in target images
  - Spatial resolution for specified weighting scheme
  - Coverage and time on target (after flagging)
  - And more! (see technical handbook)

- Information about QA review is aggregated for delivery in the QA2 Report



After Delivery – QA3

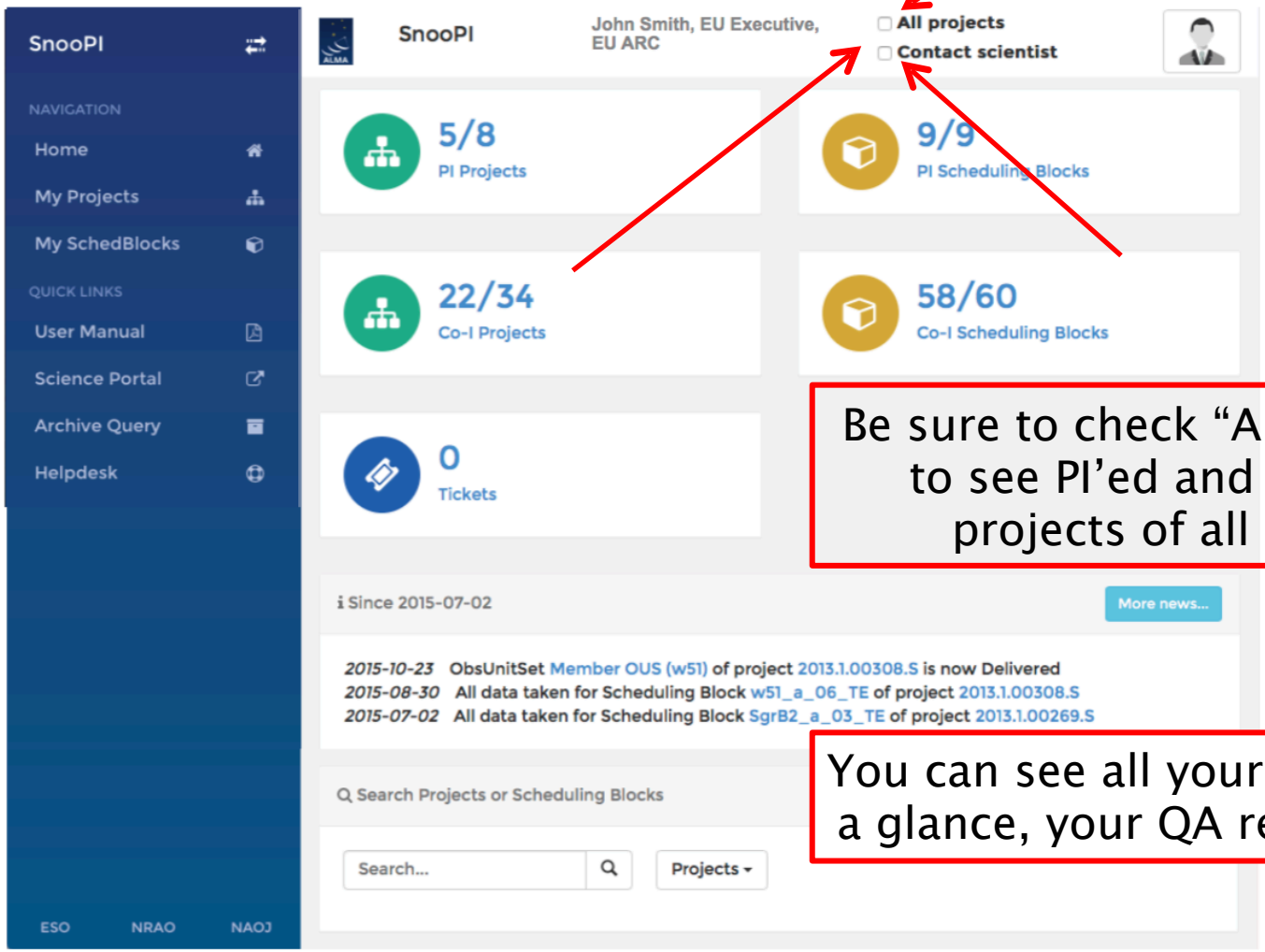
- Additional QA stage possibly triggered by PI reporting any issues underlying:
  - Data, observing procedure, calibration
- Re-evaluation of calibrated data products
  - Only occurs if QA0 -> QA2 miss something
- Proprietary period extension (within two months of delivery)



- After two months, extension only until fix is delivered

Monitor Project Status: *SnooPI*

https://almascience.eso.org/observing/snoopi



Be sure to check "All projects" to see PI'ed and co-I'ed projects of all ranks

You can see all your projects at a glance, your QA reports, etc.

Optional emails

Click Name

Click Profile

Atacama Large Millimeter/submillimeter Array
In search of our Cosmic Origins

Erica Keller
Profile
Log out

About Science Proposing Observing Data Processing Tools Documentation Help Internal Documents

Search Site

Observatory News

Additional Information for Cycle 6 Proposals
Feb 01, 2018

New Science Verification data are now available for download
Jan 22, 2018

Announcement of intent to release a new installment of Science Verification data

More...

EU ARC News

Researcher position available at the Nordic ARC node
Jan 10, 2018

Post-doc position available at the Italian ARC-node
Dec 20, 2017

2017 European Radio Interferometry School
May 11, 2017

More...

Status

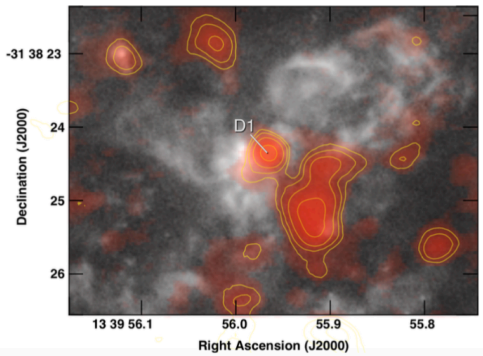
ALMA Cycle 5 Config Schedule

Refereed publications: 916
Last observed source: W43-MM1
Current configuration: C43-5

More...

Science Highlights - Molecular Gas Within the Supernebula of the Dwarf Galaxy NGC 5253

by Portal Admin — last modified Nov 30, 2017 09:38 PM

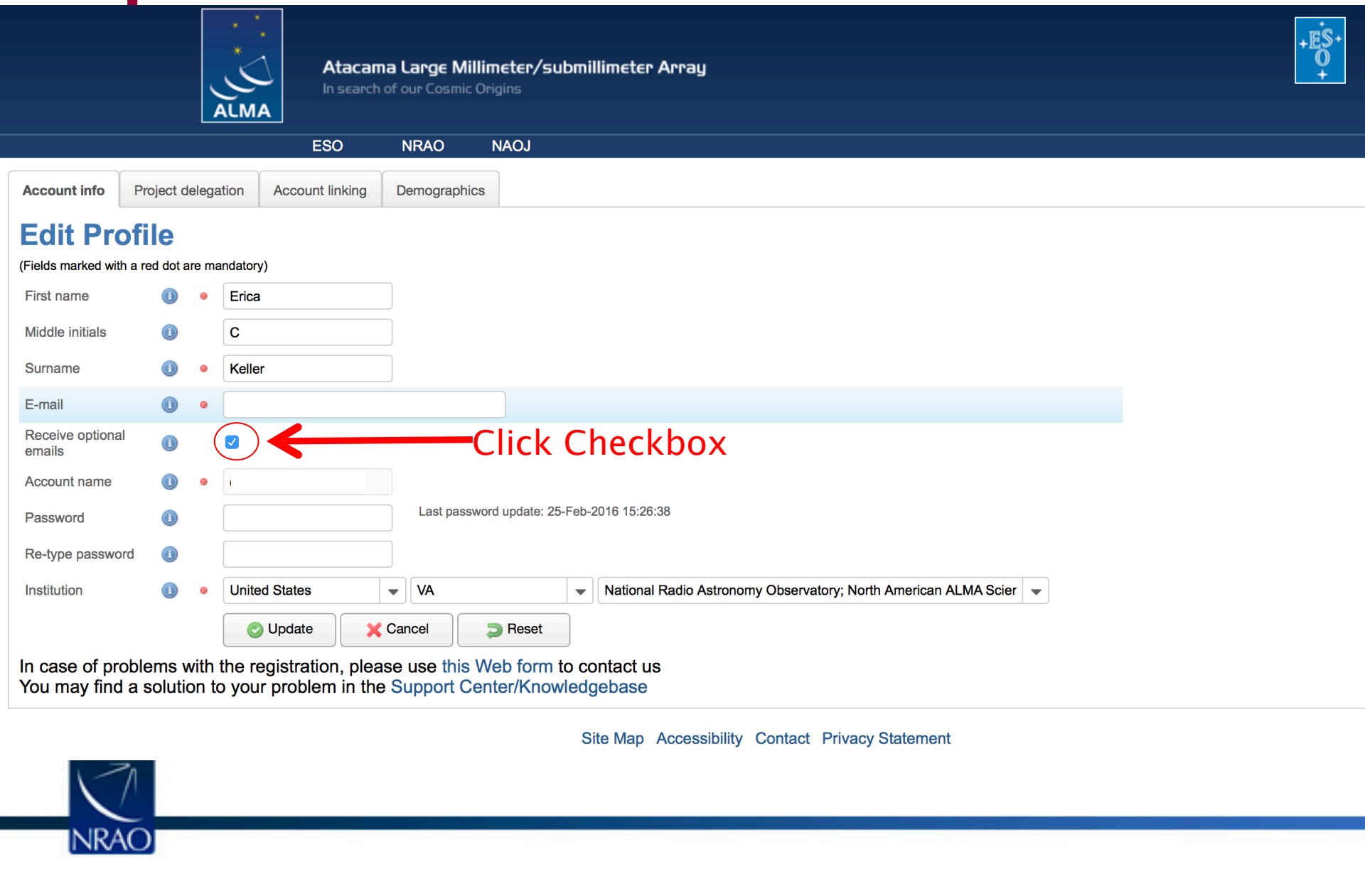


One of the areas of extragalactic research which makes great
dwarf galaxies. In a recent study by Dr. Jean Turner and her co
and ^{13}CO(3-2) emission (Cloud D1) from the core of a giant st
third of the galaxy's infrared luminosity and is in proximity to c
analysis, the region is estimated to have 1400-1800 O stars..

Full Summary...

If you want to receive emails about the status of your data before its delivered:

Optional emails



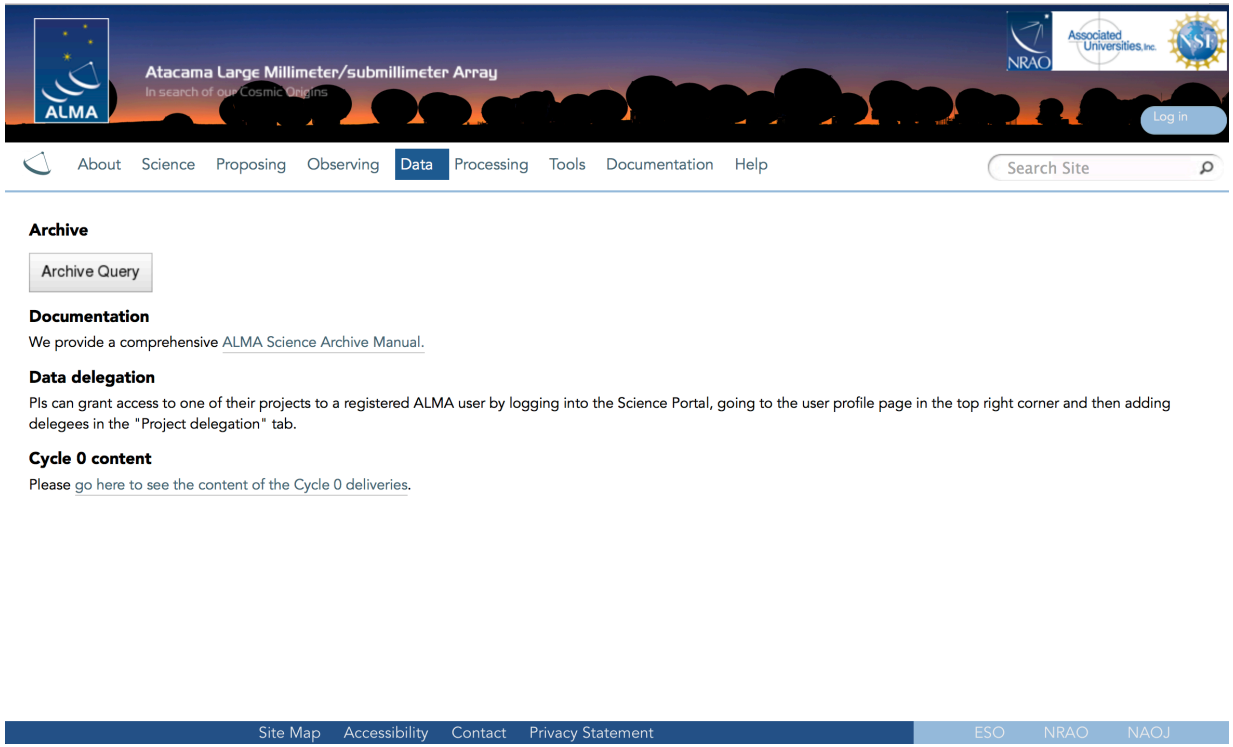
Data Delivery!

- PIs get two delivery emails:
  1. Sent when an individual observation passes QA2
     - Link to data archive with products
  2. From NAASC staff
     - Fully-calibrated MS
     - Calibration and Imaging Report
     - ADMIT products
- Triggers Start of Proprietary Period
- Publication Requirements:
  - ALMA acknowledgement
  - NRAO specific acknowledgement

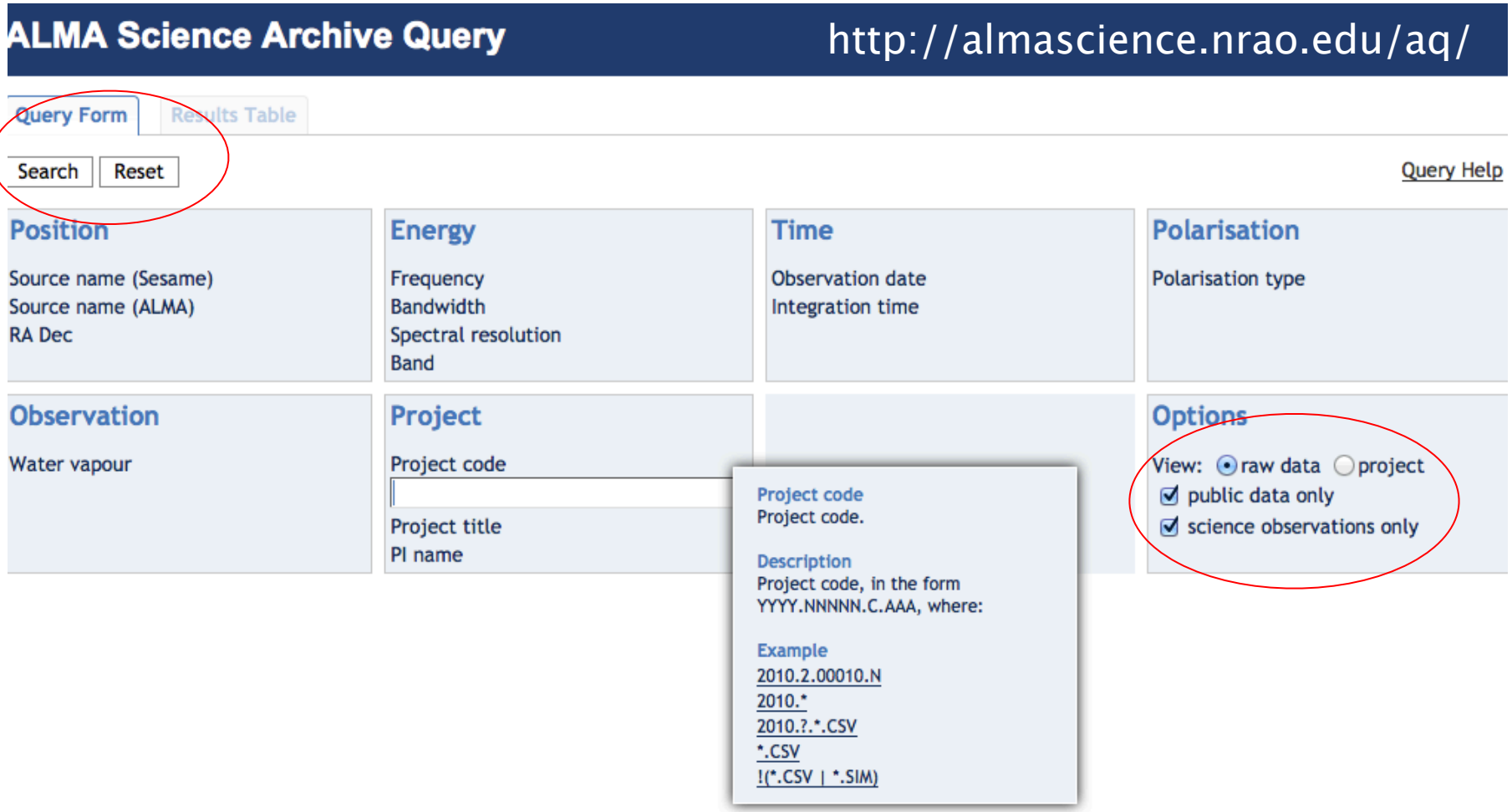
How to find the archive

Go to the science portal: https://almascience.nrao.edu

- Click on “Data” and select “Archive”



Find data in archive:
Archive Query



Archive Query

Query Form | Results Table

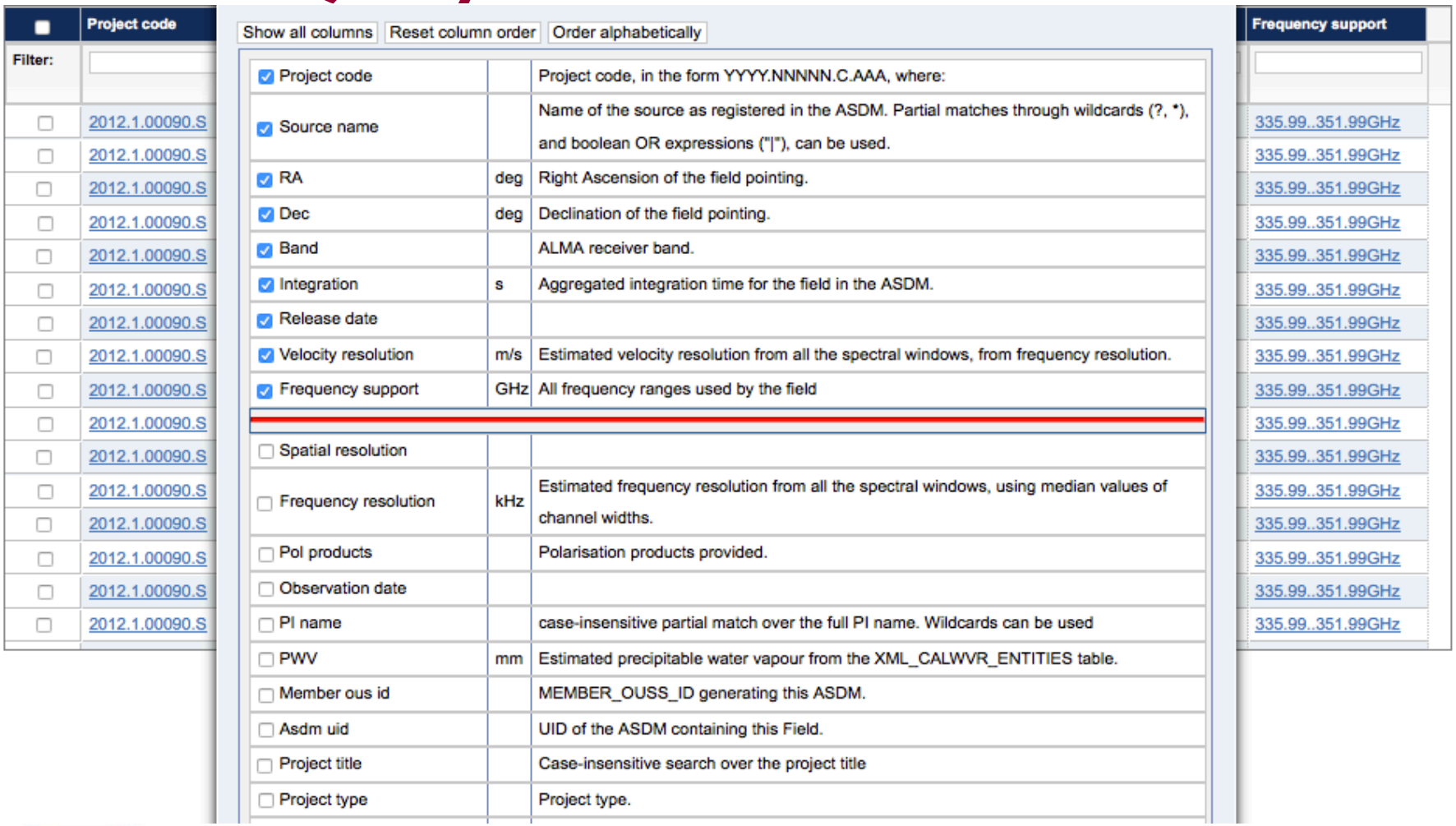
Submit download request

Results Bookmark | Export Table | Results Help

Showing 30 rows (30 before filtering). More columns

	Project code	Source name	RA	Dec	Band	Integration	*Release date* ▲	Velocity resolution	Frequency support
Filter:								m/s	
☑	2012.1.00090.S	S2CLS_UDS110	02:18:48.44	-05:18:05.0	7	9.326	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☑	2012.1.00090.S	S2CLS_UDS156	02:18:24.23	-05:22:53.4	7	8.836	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☑	2012.1.00090.S	S2CLS_UDS160	02:18:23.86	-05:11:36.2	7	8.842	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS168	02:18:20.34	-05:31:41.6	7	8.843	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☑	2012.1.00090.S	S2CLS_UDS199	02:18:07.38	-04:44:11.7	7	8.812	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS204	02:18:03.01	-05:28:39.8	7	8.873	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS216	02:17:56.80	-04:52:39.6	7	8.82	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS252	02:17:37.79	-05:20:10.2	7	8.827	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS286	02:17:25.76	-05:25:36.5	7	9.657	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS292	02:17:21.85	-05:19:03.3	7	8.815	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS298	02:17:19.90	-05:09:36.4	7	9.55	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS334	02:17:02.81	-04:57:24.9	7	8.856	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS408	02:16:22.59	-05:11:06.0	7	8.819	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS421	02:16:17.62	-05:09:02.0	7	8.803	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS47	02:19:24.97	-05:09:19.9	7	8.785	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz

Archive Query: more columns



Project code	Frequency support
Filter:	
2012.1.00090.S	335.99..351.99GHz
2012.1.00090.S	335.99..351.99GHz
2012.1.00090.S	335.99..351.99GHz
2012.1.00090.S	335.99..351.99GHz
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2012.1.00090.S	335.99..351.99GHz
2012.1.00090.S	335.99..351.99GHz

Show all columns | Reset column order | Order alphabetically

☑ Project code		Project code, in the form YYYY.NNNNN.C.AAA, where:
☑ Source name		Name of the source as registered in the ASDM. Partial matches through wildcards (?, *), and boolean OR expressions ("|"), can be used.
☑ RA	deg	Right Ascension of the field pointing.
☑ Dec	deg	Declination of the field pointing.
☑ Band		ALMA receiver band.
☑ Integration	s	Aggregated integration time for the field in the ASDM.
☑ Release date		
☑ Velocity resolution	m/s	Estimated velocity resolution from all the spectral windows, from frequency resolution.
☑ Frequency support	GHz	All frequency ranges used by the field
☐ Spatial resolution		
☐ Frequency resolution	kHz	Estimated frequency resolution from all the spectral windows, using median values of channel widths.
☐ Pol products		Polarisation products provided.
☐ Observation date		
☐ PI name		case-insensitive partial match over the full PI name. Wildcards can be used
☐ PWV	mm	Estimated precipitable water vapour from the XML_CALWVR_ENTITIES table.
☐ Member ous id		MEMBER_OUSS_ID generating this ASDM.
☐ Asdm uid		UID of the ASDM containing this Field.
☐ Project title		Case-insensitive search over the project title
☐ Project type		Project type.

Archive Query

Query Form | Results Table

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☑	2012.1.00090.S	S2CLS_UDS156	02:18:24.23	-05:22:53.4	7	8.836	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☑	2012.1.00090.S	S2CLS_UDS160	02:18:23.86	-05:11:36.2	7	8.842	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS168	02:18:20.34	-05:31:41.6	7	8.843	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
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☐	2012.1.00090.S	S2CLS_UDS204	02:18:03.01	-05:28:39.8	7	8.873	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS216	02:17:56.80	-04:52:39.6	7	8.82	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
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☐	2012.1.00090.S	S2CLS_UDS286	02:17:25.76	-05:25:36.5	7	9.657	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
☐	2012.1.00090.S	S2CLS_UDS292	02:17:21.85	-05:19:03.3	7	8.815	2014-11-07T09:35:00.000	27236.96	336.00..351.99GHz
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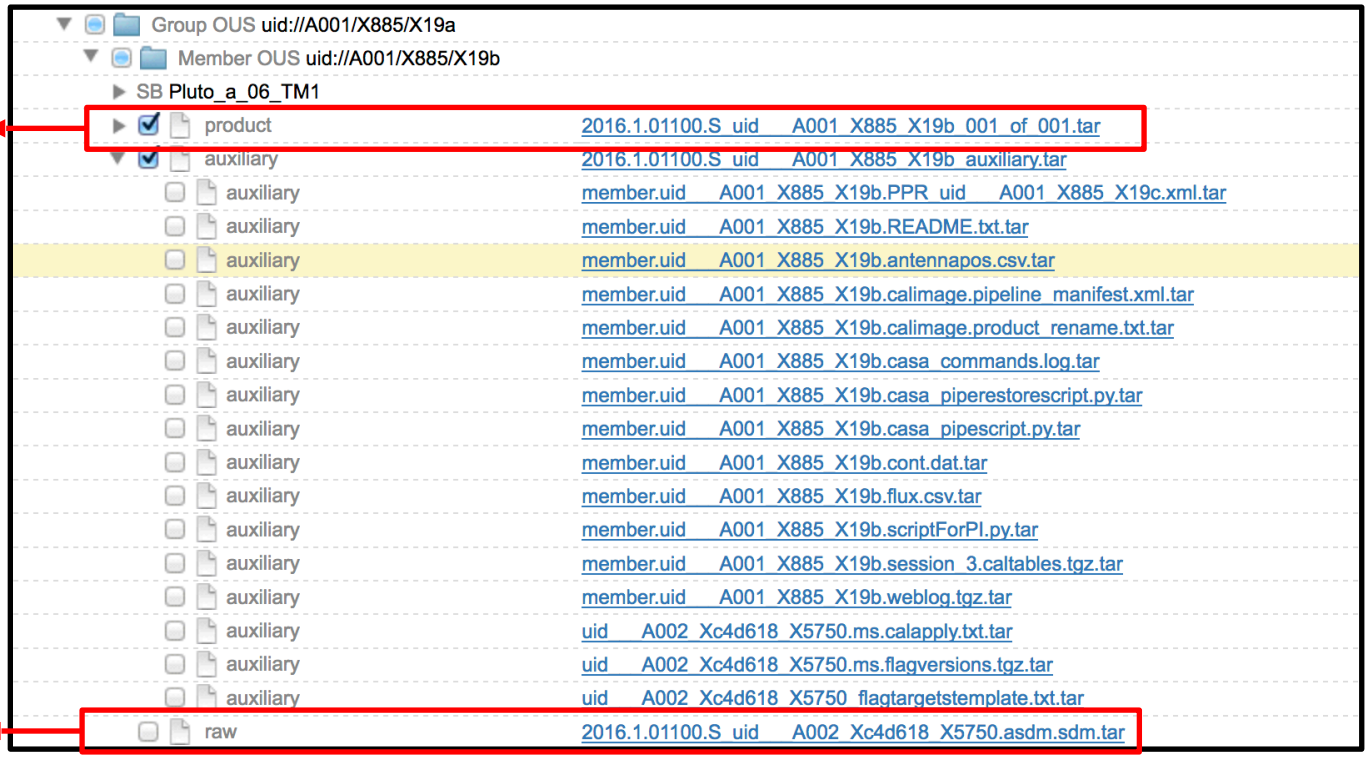
Download requests

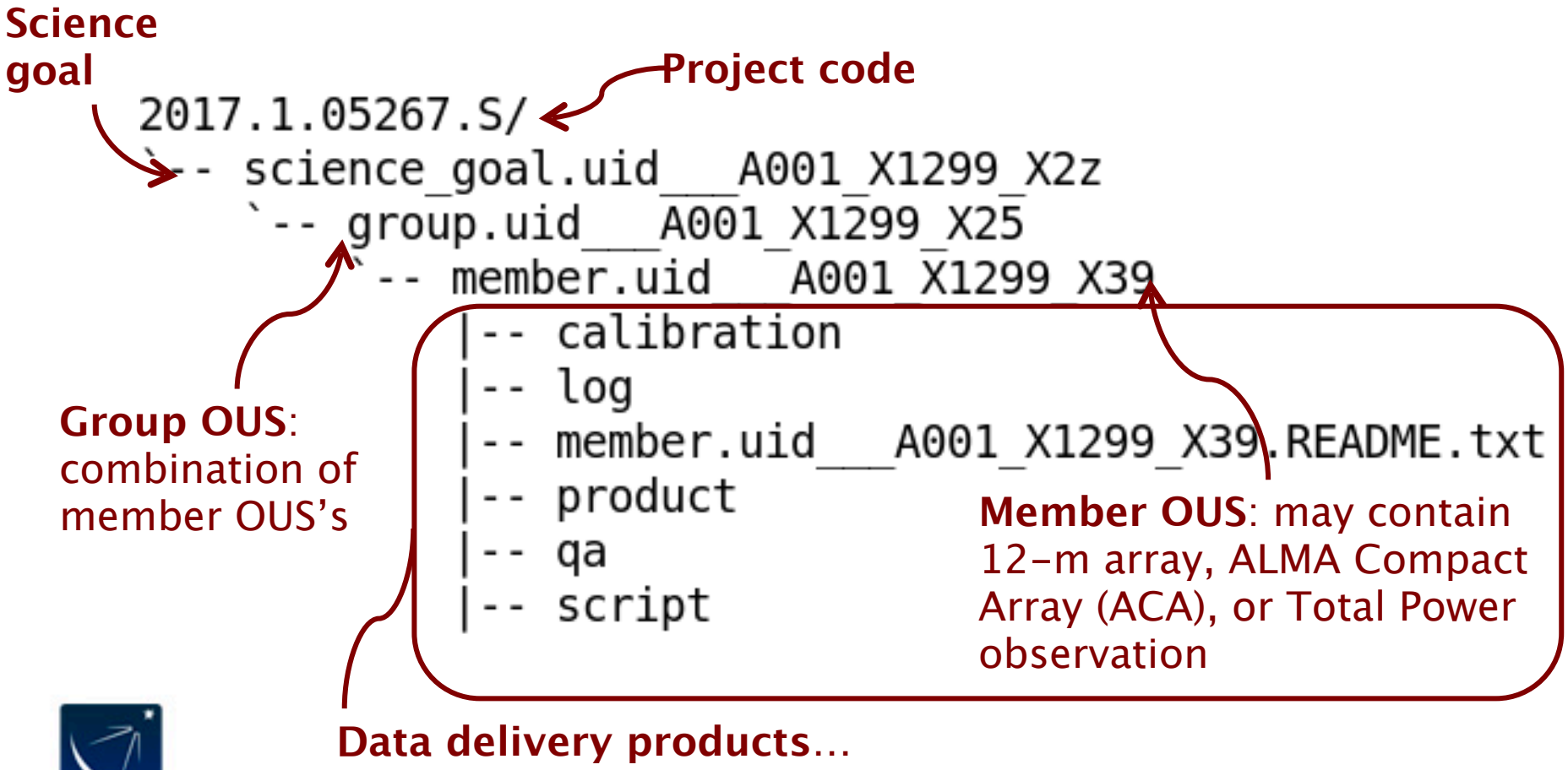
Products

Raw data



QA2 Data Products Package: the processed data

After un-tarring the processed data we have a directory tree:



QA2 Data Products Package: the processed data

Calibration Directory:

Calibration tables generated by the pipeline

Contains manual flagging commands, continuum selection, flux measurements for calibrators

```
|-- calibration
|    |-- member.uid___A001_X1299_X39.hifa_calimage.auxproducts.tgz
|    |-- member.uid___A001_X1299_X39.session_1.auxcaltables.tgz
|    |-- member.uid___A001_X1299_X39.session_1.caltables.tgz
|    |-- uid___A002_Xc8ed15_X1a9.ms.calapply.txt
|    |-- uid___A002_Xc8ed15_X1a9.ms.flagversions.tgz
|    `-- uid___A002_Xc8ed15_X1a9_target.ms.auxcalapply.txt
```

All flags will be restored during calibration

QA2 Data Products Package: the processed data

Calibration Products:

Log of equivalent CASA commands (non-executable)

```
|
|-- log
|    `-- member.uid___A001_X1299_X39.hifa_calimage.casa_commands.log
|-- member.uid___A001_X1299_X39.README.txt
|-- product
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pb.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pbcor.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.mask.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.pbcor.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.pb.fits.gz
|    |-- member.uid___A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pbcor.fits
|    `-- member.uid___A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pb.fits.gz
```

Directions to access QA comments and restoration instructions

Calibration and Target images produced during reduction (may be representative)

QA2 Data Products Package: the processed data

Calibration Scripts and Weblog:

Weblog contains plots and images from reduction and imaging. Unpack this for lots of information!

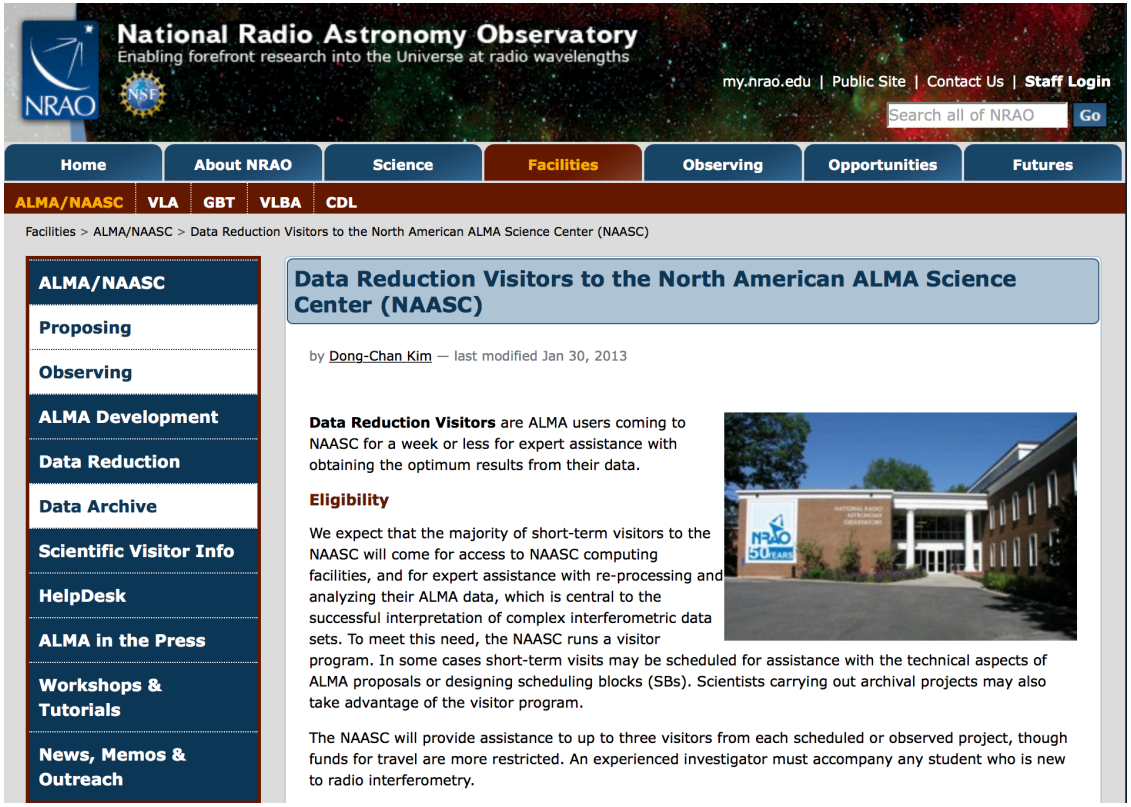
```
|-- qa
|   `-- member.uid___A001_X1299_X39.hifa_calimage.weblog.tgz
`-- script
    |-- member.uid___A001_X1299_X39.calimage.pipeline_manifest.xml
    |-- member.uid___A001_X1299_X39.calimage.product_rename.txt
    |-- member.uid___A001_X1299_X39.hifa_calimage.casa_piperestorescript.py
    |-- member.uid___A001_X1299_X39.hifa_calimage.casa_pipescript.py
    |-- member.uid___A001_X1299_X39.hifa_calimage.pprequest.xml
    `-- member.uid___A001_X1299_X39.scriptForPI.py
```

Run scriptForPI.py to restore calibration

Commands to re-run the pipeline

Resources After Delivery

- HelpDesk
- Face to Face visits in Charlottesville: https://science.nrao.edu/facilities/alma/visitors-shortterm



ALMA

For more info:

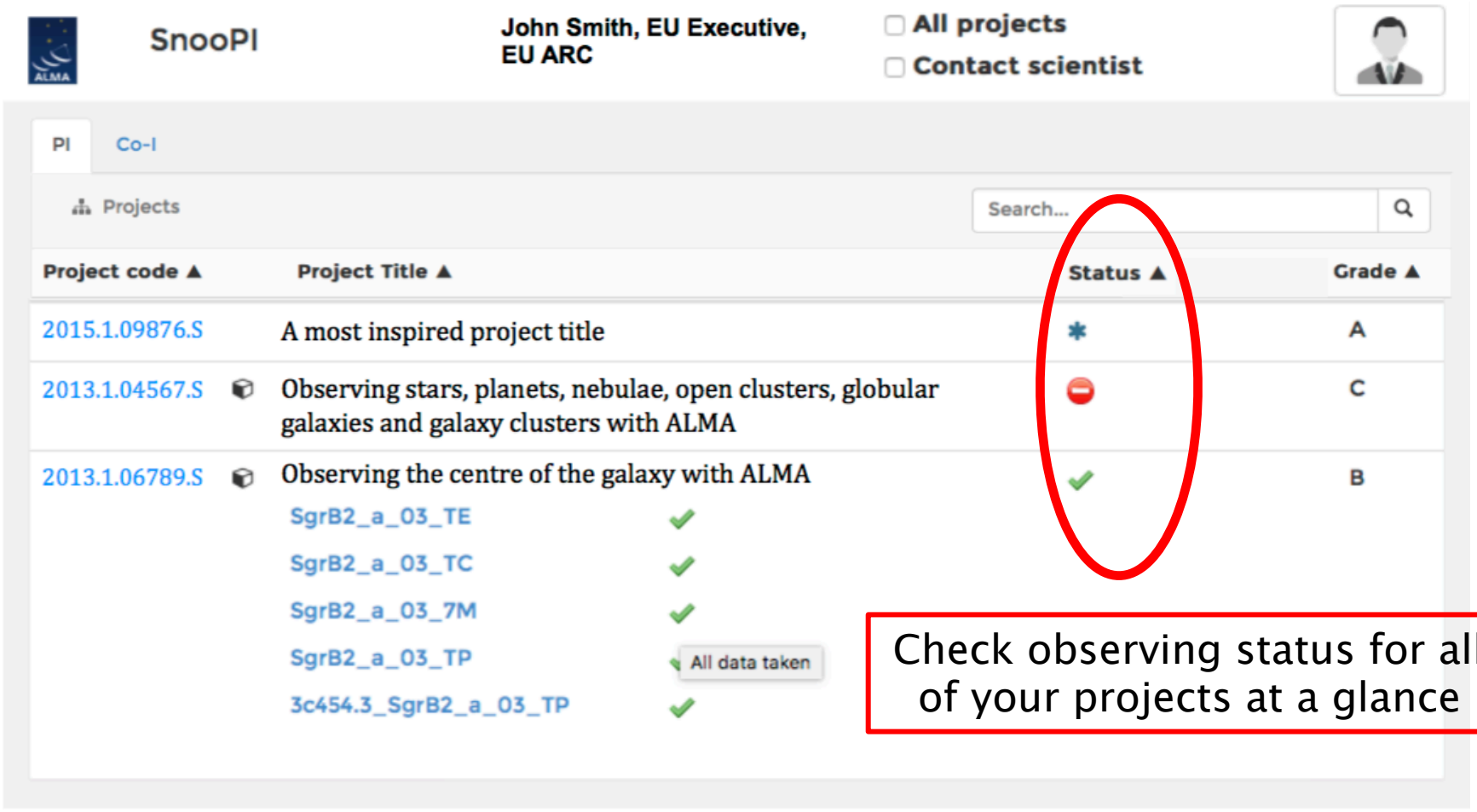
https://almascience.nrao.edu/

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC), and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI), and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction and operation of ALMA.

NRAO

Monitor Project Status: *SnooPI*

Listing of PI'ed projects



Check observing status for all of your projects at a glance

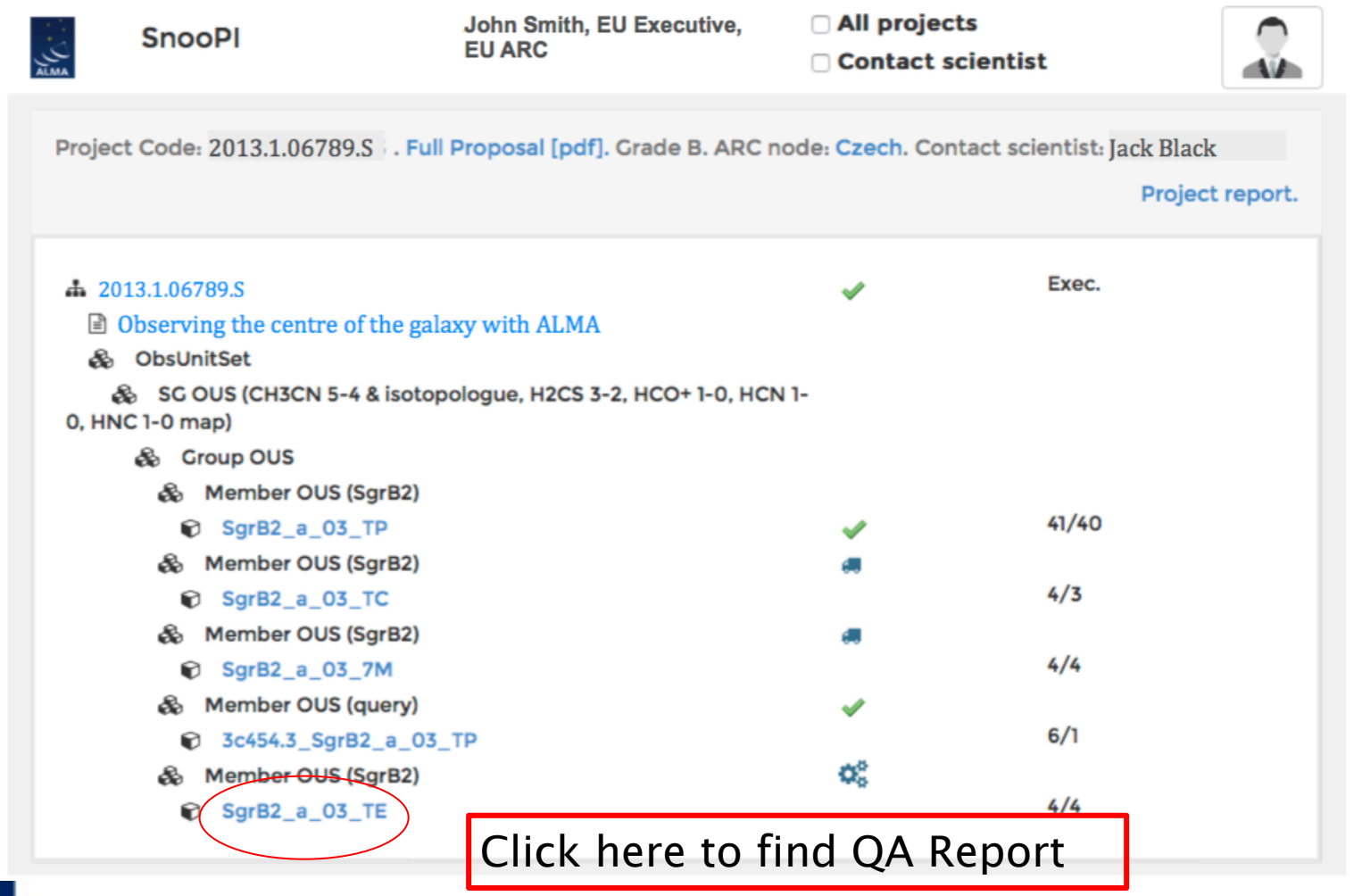
Monitor Project Status: *SnooPI*

Listing of PI'ed projects

- Project has been submitted (Phase 1)
- Rejected at proposal review stage
- Approved but SBs not yet prepared
- SBs prepared but are not yet in the observing queue
- SBs are in the observing queue but not yet taken
- Some data has been taken
- All the data has been taken
- Completed and delivered
- Partially completed and all data taken has been delivered
- Project is timed out
- Project cancelled and not observed
- Project that are not to be observed
- Unknown status

Monitor Project Status: *SnooPI*

Single Project View:



Monitor Project Status: *SnooPI*

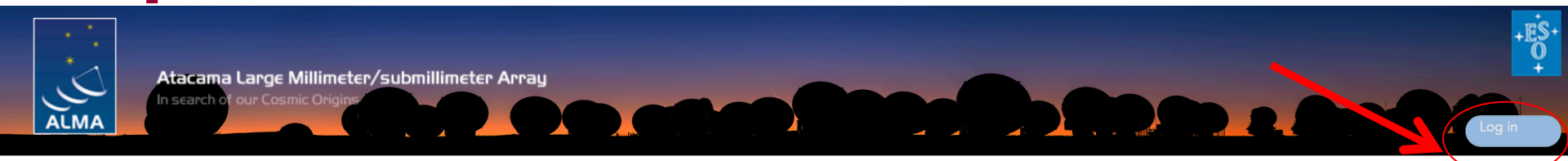
Single Project View:

- a set of gears indicate that the OUS is being processed;
- a truck indicates that the OUS has been delivered
- an ambulance indicates an OUS for which QA3 is in progress.

Monitor Project Status: Optional emails

- Subscribe to email notification for updates on changes to project status through your Science Portal user profile
  - …
  - Phase2Submitted
  - Running
  - Partially Observed
  - Fully Observed
  - Pipeline Processing
  - …
- With or without optional emails, PIs always receive notification when new data are available

Optional emails



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Observatory News

Additional Information for Cycle 6 Proposals
Feb 01, 2018

New Science Verification data are now available for download
Jan 22, 2018

Announcement of intent to release a new installment of Science Verification data

More…

EU ARC News

Researcher position available at the Nordic ARC node
Jan 10, 2018

Post-doc position available at the Italian ARC-node
Dec 20, 2017

2017 European Radio Interferometry School
May 11, 2017

More…

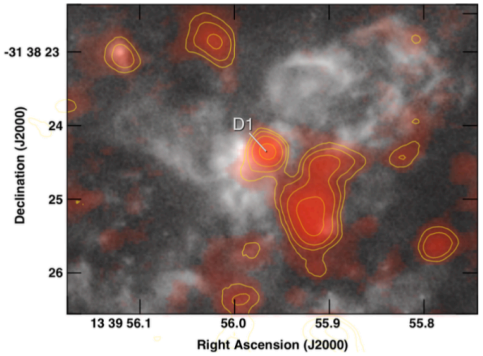
Status

ALMA Cycle 5 Config Schedule

Refereed publications: 916
Last observed source: W43-MM1
Current configuration: C43-5

More...

Science Highlights - Molecular Gas Within the Supernebula of the Dwarf Galaxy NGC 5253



One of the areas of extragalactic research which makes great use of ALMA's resolution and sensitivity is the study of the molecular gas properties of dwarf galaxies. In a recent study by Dr. Jean Turner and her collaborators, they make use of Band 7 ALMA observations to detect warm ^{12}CO(3-2) and ^{13}CO(3-2) emission (Cloud D1) from the core of a giant star-forming region, in the dwarf galaxy NGC 5253. This "supernebula" is the source of one-third of the galaxy's infrared luminosity and is in proximity to optical clusters with measured stellar ages of ~ 1 Myr. From radio recombination line analysis, the region is estimated to have 1400-1800 O stars..

Full Summary...

Optional emails